INTRASPECIFIC VARIATION OF TAXONOMIC CHARACTERS IN COLEOMYIA AND TWO NEW SPECIES

(Diptera: Asilidae)

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The genus *Coleomyia* Wilcox & Martin (Bull. Brooklyn Ent. Soc.) was erected in 1935 to receive *Metapogon setiger* Cole the genotype, and three other species there described. During the past five years the writer and his wife have collected nearly 700 specimens of this genus. Also, a smaller collection, which includes paratypes of the species described by Wilcox & Martin, was assembled a number of years ago. Thanks are due my friend Mr. Joseph Wilcox for the series of *C. crumborum* from California. The types of *C. alticola* James and *C. setiger* (Cole) have not been seen, but there has been no difficulty in identifying the two species. The holotypes and allotypes of the three species described by Wilcox & Martin, *C. sculleni*, *hinei*, and *rainieri*, are at hand. Descriptions of two new species, a revised key, and a discussion of the intraspecific variation of the taxonomic characters used for the identification of the species of *Coleomyia* are presented. Holotypes and allotypes mentioned in this paper will be deposited on a permanent loan basis at the California Academy of Sciences. Paratypes, metatypes, and topotypes are in the writer's collection.

Coleomyia crumborum Martin, new species

Male: Length 6–7 mm. Head black; face, front, vertex, light yellowish or brassy, brown pollinose; occiput gray pollinose; palpi, proboscis, antennae, and all bristles, black. Ocellar bristles in 3 rows, arranged 4–2–2, outside anterior and posterior pairs weaker; 6 strong bristles on either side of occiput with other weaker bristles. Pale hair begins among occipital bristles and extends down and covers the lower occiput; pale hair on proboscis and palpi. Antennal proportions similar to other species of the genus. Holotype with pair of strong bristles on both first and second antennal segments, some paratypes with only a single strong bristle on these segments.

Thorax black, entirely gray pollinose with indistinct overcast pattern of light brown, median geminate dorsal stripe indistinct. Neck with pale hair, pronotum with pale hair and 2 weak pale bristles on either side opposite first spiracle. Bristle pattern similar to other species, 7 dorsocentral bristles. Pleura gray pollinose with slight tinge of yellow in some lights, mesosternum pollinose below with polished black spot covering about the anterior third of the sclerite; metasternum gray pollinose, pleura gray polli-

[1] Grant-in-aid Funds from Oregon State College contributed to the financing of these studies.

nose with 6 white hypopleural bristles. Dorsum of scutellum and margin gray pollinose with 3 strong marginal bristles and 4 short, weak bristles.

Abdomen black with short, pale appressed hairs and silvery gray pollinose markings on segments 1 to 5, segment 5 light brown on some paratypes, segments 6 and 7 brown pollinose. First segment pollinose on lateral margins, with 4 pale weak lateral bristles surrounded by pale hair as long as bristles; second segment pollinose on lateral margins with broad pollinose dorsal band as wide as anterior black dorsal area which is triangle-shaped posteriorly with the point extended as an indistinct, narrow line which almost separates the pollinose band, this line more distinct on some paratypes and less on others. Pollinose bands on segments 3 and 4 with anterior and posterior narrow dark crescents, and small posterior crescent on segment 5; a median line of thin pollen almost separates each band, more distinct on segment 3 on holotype, not so distinct on segments 3 to 5 on some paratypes and more distinct on others. Venter segments 1 to 4 gray pollinose, 5 and 6 brown pollinose, segment 7 polished brownish black; hypopygium brownish dorsally and brown and black ventrally, with black hairs.

Legs black; bristles black except posterior row pale bristles on anterior 4 tibiae; coxae gray pollinose with white pile.

Wings fumose; anterior crossvein usually distinctly before middle of discal cell. Halteres on holotype with brown base and yellow knob, some paratypes with orange-yellow knobs.

Female: Length 7–8 mm. Similar to male with these exceptions. Face, front, vertex usually darker than in male; posteriorly ocellar tubercle with brown pollinose triangle. Thorax, dark central brown stripe bisected by narrow, setulose, grayish brown pollinose line and separated from lateral golden pollinose markings by grayish brown pollinose line, humerus and lateral margin of meso- and metathorax gray to brown pollinose. Pleura gray pollinose, mesosternum gray pollinose below and posterior to anterior polished black spot, 5 black and 1 white hypopleural bristles on allotype, some paratypes with all white or all black hypopleural bristles, others with mixtures. Two strong, black median scutellar bristles with 2 weaker bristles. Abdomen black with short, pale, appressed hair; lateral margin first abdominal segment with most of lateral pollinose areas covered with white hair, 1 pale bristle on one side of allotype and 4 on other; anterior angle of second segment gray pollinose. Abdominal segments 2 to 5 with narrow posterior gray pollinose bands broadly interrupted in middle, segments 6 to 8 shining black; venter polished brown, posterior angles of segments 2 to 4 gray pollinose. Leg, bristles, and hairs on legs black.

Holotype: Male. San Bernardino Co., Barton Flat, 6300 ft., California, July 12, 1947 (J. Wilcox, Coll.)

Allotype: Female, August 9, 1942, same locality and collector.

Paratypes: Same locality and collector as holotype, 21 ♂ ♂, August 7-12, 1947; 1 ♂, August 9, 1942; 2 ♂ ♂, San Bernardino, County, Jenks Lake, Calif., July 18, 1943 (C. H. Martin, Coll.). Same locality and collector as holotype, 19 ♀ ♀, August 7-12, 1947;

2 ♀ ♀, August 9, 1942; 1 ♀, San Bernardino County, Jenks Lake, Calif., July 18, 1943 (C. H. Martin, Coll.).

Named for my friends Marion Pohlman Crumb, S. E. Crumb, Sr., and S. E. Crumb, Jr. (deceased).

Coleomyia rubida Martin, new species

Male: Length 6.5 mm. Face, front, vertex, occiput, grayish brown pollinose; proboscis, palpi, antennae, all bristles, black; 5 weak lateral frontal bristles, 4 strong and 4 weak ocellar bristles, about 16 weak black occipital bristles on each side of occiput, sparse pale hair on lower occiput, proboscis and palpi; 1 strong bristle on first antennal segment and 2 short weak ones on either side, 1 long and 1 somewhat shorter bristle on second antennal segment. Sparse pale hair on neck, even more spare pale hair on pronotum, one strong black bristle with 3 very short weak black bristles at base on each side of pronotum. Thoracic dorsum with dark brown central stripe narrowly separated by gray pollinose setulose stripe; reddish brown spot around base of first dorsocentral bristle and extending posteriorly as a line beside the central stripe and along the line formed by the dorsocentral bristles; a grayish brown pollinose line originating at the gray humerus and extending posteriorly around the margin of the reddish-brown spot to the second dorsocentral bristle where it continues parallel to the reddish brown line; lateral margins of dorsum same color as central stripe; transverse suture brownish pollinose. Pleura grayish brown pollinose, mesosternum gray pollinose above and posterior to the anterior polished black spot; metasternum and pleura gray pollinose, 2 black hypopleural bristles; scutellum dorsum brownish gray pollinose with margin broadly black, two scutellar bristles.

Abdomen black: lateral margins of first abdominal segment silvery pollinose with 4 pale bristles on posterior angle and pale hair anteriorly, small pollinose spot on anterior angle of second abdominal segment, narrow, widely interrupted silvery pollinose bands on posterior margin of segments 2 to 5, narrow, interrupted band on posterior margin of segment 6 golden brown pollinose, seventh segment with small lateral spot of golden brown pollinose on lateral margins; pygidium mostly dark reddish-brown with black hairs; venter with short, black appressed hairs, first segment brownish tan, narrow black line on posterior margin, second segment with narrow anterior and posterior tan bands, broad middle black band covered with white pruinosity, third and fourth segments black, narrow anterior and broad posterior bands joined medianly by transverse pollinose wedge, posterior margin same color as first segment, fifth and sixth segment polished black with narrow silvery pollinose band on posterior margin, seventh segment polished black.

Fore coxae black, thin gray pollinose, some sparse short white hair, posterior four coxae red, thin gray pollinose, middle coxae with fewer hairs than anterior coxae, posterior coxae without hair, rather short, weak, pale bristles on apices of all coxae, rest of leg black, femora with basal and apical red bands approximately the width of the second posterior cell in the wing, approximately basal third of tibiae red, bristles black. Claws black, pulvilli dark.

Halteres at base light brown, stem and knob yellowish brown. Basal three-eighths of wings thinly white, second basal cell almost totally white, hyaline band across discal cell, apex of wing lightly infuscated, discal cross vein at middle of discal cell.

Female: Length 10 mm. Similar to male. Abdominal segment five with a more broadly interrupted posterior narrow silvery pollinose band than other bands, sixth and seventh segments black. Black spot on mesosternum. Legs more reddish than those of male. Wings very lightly fumose. Pulvilli lighter than in male.

Holotype: Male. Mt. Hood, Still Creek Forest Camp, Oregon, August 10, 1947. Charles H. Martin, Coll.

Allotype: Female, Crater Lake, Oregon, August 8, 1947. Dorothy Martin, Coll.

Paratypes: One ♂, Deschutes Co., Paulina Lake, Oregon, August 9, 1946; one ♂, Mt. Hood, Parkdale, Oregon, July 19, 1947; two ♂ ♂, Crater Lake, Oregon, August 8, 1947, August 30, 1949, The Martins, Coll. Four ♀ ♀, Crater Lake, Oregon, August 8, 1930; three ♀ ♀, Mt. Hood, Parkdale, Oregon, July 19, 1947; one ♀, Deschutes Co., Paulina Lake, Oregon, August 9, 1946, The Martins, Coll.

Key to the Species of Coleomyia

Males

1. Basal portion of wing distinctly white, infuscated apically 2
– Basal portion of wing base not white, partially hyaline or totally infuscated 6
2. Dorsocentral bristles absent; pollinose wedge on hind angle of abdominal segment 2 barely perceptible or lacking, increasing in extent on 3 and 4, about equal in extent on segments 4 to 6. Length 6.5–9 mm. (Oregon; Idaho) ..... *hinei* W. & M.
– Strong dorsocentral bristles 3
3. Small pollinose wedges on posterior angle of abdominal segments increasing in extent from 2 to 6, frequently lacking on segment 2. Length 5.5–7 mm. (Colorado; New Mexico) ..... *alticola* James
– Either white, or brownish pollinose bands, or both, on posterior margins of abdominal segments, bands either interrupted, or complete, or both 4
4. Basal one-fifth of wing white, tip lightly infuscated; white pollinose bands on posterior margins of abdominal segments; knobs of halteres yellow. Length 7.5 mm. (Washington) ..... *rainieri* W. & M.
– Basal two-fifths of wing white, tip infuscated 5
5. Posterior abdominal fasciae widely interrupted; 4 posterior coxae red, white pollinose; femora black with prominent red band basally and apically, base of tibiae reddish, black apically. Length 5.5–6 mm. (Oregon) ..... *rubida* n. sp.
– Abdominal fasciae on posterior margin of abdominal segments entire; all coxae black, white pollinose; legs black except very narrow red inconspicuous bands on femora and tibiae. Length 6–8.5 mm. (Oregon; Washington) ..... *setiger* (Cole)

6. Knobs of halteres claret red; 3 to 6 dorsocentral bristles; anterior lateral margin of at least abdominal segments 2 to 4 black, segments 5 to 8 may be totally white pollinose or with lateral anterior black areas. Length 6.5–8 mm. (Oregon) ..... *sculleni* W. & M.
Knobs of halteres vary orange, yellow, light brown; 7 to 9 dorsocentral bristles; laterial margins of abdominal segments 1 to 5 entirely white pollinose, 6 to 8 brownish pollinose. Length 6–7 mm. (California). ..... *crumborum* n. sp.

Females

1. Dorsocentral bristles absent; abdominal segments 1 to 5 with small, silver pollinose wedges on posterior angles. Length 7–9 mm. (Oregon; Idaho) ..... *hinei* W. & M.
Dorsocentral bristles present 2
2. Abdomen black; abdominal segments 2 to 5 with small wedges of silver pollen on posterior angles, 6 and 7 without pollen. Length 7–8.5 mm. (Colorado; New Mexico) ..... *alticola* James
Pollinose fasciae on posterior margin of abdominal segments entire or interrupted, or both 3
3. Wings hyaline; face, front, vertex, gray silver pollinose. Length 7—8 mm. (Washington) ..... *rainieri* W. & M.
Wings fumose; face, front, vertex, golden silvery or brownish pollinose 4
4. Posterior 4 coxae red, white pollinose; hind femora black with basal and apical red band; basal half or more of hind tibiae red, less red on anterior tibiae, apical portion black. Length 7–9.5 mm. (Oregon) ..... *rubida* n. sp.
All coxae black; legs black except very narrow red band basally and apically on femora 5
5. Narrow silvery pollinose band on posterior margins of abdominal segments broader in middle than on sides of abdomen; knobs of halteres claret red; usually one strong white bristle on pronotum. Length 7–9.5 mm. (Oregon) ..... *sculleni* W. & M.
Narrow posterior silvery pollinose bands on abdominal segments uniform in width; halteres not claret red 6
6. Usually one strong, black bristle on pronotum; bristles on lateral margins of first abdominal segment usually tan or dirty white; polished area on lower portion of mesosternum extends from anterior to posterior margins. Length 6.5 - 10 mm. (Oregon; Washington) ..... *setiger* (Cole)
Usually two or more weak, pale bristles on pronotum; bristles on lateral margins of first abdominal segment pale white; mesosternum gray pollinose below and posterior to anterior polished black spot. Length 7–8 mm. (California) ..... *crumborum* n. sp.

Intraspecific Variation

The shape of the antennae, the extent of the pollinosity or pruinosity, and the color and number of hairs or bristles present on the various parts of the body of Asilidae are commonly used as characters to separate species. The writer has often wondered how

stable these and other characters would prove to be when a fairly long series was studied. This study of *Coleomyia* shows that such characters in this genus do have a rather wide range within the species.

ANTENNAE—The shape of the antennae of all species of *Coleomyia* is not quite as dependable as implied by Wilcox & Martin, (1. c. p. 212). James (Kansas Ent. Soc. 1941) indirectly calls attention to this when he states that the figure of the antennae published for *C. sculleni* would serve for *C. alticola* James. A series of *alticola* collected by the writer confirms this observation. The variation found in the seven species at hand indicates that this character is not always dependable.

PRONOTAL BRISTLES—The bristles on the pronotum which are opposite the mesothoracic spiracle have been used in the key to separate the females of *setiger* from *crumborum*. Sometimes a strong pale bristle rather than the usual black one is found on *setiger;* on some specimens the bristle is found on only one side. There are usually several pale, weak bristles on *crumborum* but one specimen bears only a single weak bristle. In both species the bristles are associated with long, white pile.

GENITALIA—No differences were found in the male genitalia of *Coleomyia* which would readily separate one species from another. In all other genera of Asilidae studied by the writer, there are some structures of the genitalia which are of specific value.

VARIATIONS OF COLEOMYIA SETIGER

The writer has studied 335 specimens of *Coleomyia setiger* (Cole) from Mt. Hood, Santiam Pass, Corvallis, Washington County, and Mary's Peak, Oregon, and from Olympia, Puyallup, and Tacoma, Washington. The great variability in this species seems to be of no specific or subspecific value.

COLOR—The coloration of the pollinosity on the dorsum of both thorax and abdomen consists of two basic colors in *setiger*. Bluish-gray predominates on the thorax of the male, and brown on the female. In some specimens the brown markings are almost obscured by the bluish-gray pollinosity, while this color is obscured by the brown in other specimens. The males always have some brown present, but on some of the females the blue gray is completely replaced by brown shades.

The same variation in color is true for the pollinose stripes on the posterior margin of the abdominal segments. On some males

the brown overcast almost obscures the gray beneath, while in others the gray obliterates the brown on most of the segments.

SCUTELLUM—Both sexes of *setiger* could be divided into two distinct groups by the color of the margin of the scutellum. Sixty-five per cent of 320 specimens had the margin black, while the rest had pollinose margins. In a few specimens there was a graduation from pollinosity to black, but usually the character was sharp.

The number of bristles on the margin of the scutellum varied from two to six. When more than two bristles were present, the additional ones were sometimes short and sometimes as long as the median two. The female specimens from Mary's Peak, Oregon, shows a sharp tendency to have three or more bristles; 36 specimens had two bristles, while 41 had three to six bristles. In contrast, 45 specimens from Corvallis, Oregon, had two bristles, while only seven had three to six bristles.

ABDOMEN—The most surprising variability in *Coleomyia* is that the dorsum of the mid-segments of the abdomen is totally pollinose in some specimens of *setiger* and *sculleni,* while in other specimens of the same species the pollinosity is restricted to the posterior margin. With this character the 135 males of *setiger* at hand can be divided into these three distinct groups:

Group I—Pollinosity on posterior margin of fourth abdominal segment may extend as a distinct or indistinct median wedge toward or to the anterior margin; fifth abdominal segment totally pollinose.

Group II—Pollinosity on posterior margin of the fifth abdominal segment may extend as a distinct or indistinct median wedge toward or to the anterior margin. The anterior lateral angles may be either black or gray pollinose. Cole's type specimen with the anterior lateral angle black traces to this group.

Group III—The pollinosity on the fifth abdominal segment sharply confined to the posterior half of the segment; anterior half black.

Groups II and III share the common character of having the pollinosity of the fourth abdominal segment confined to the posterior half. Group II could be subdivided because the anterior lateral angle of the fifth segment is either lack or pollinose; the segment is never totally pollinose as in Group I.

A taxonomist with only a few specimens of the three distinct patterns would feel tempted to describe either species or subspecies. However, the series at hand leads the writer to consider these patterns in *setiger* as only variations within the species. Also other characters break the three groups into other major groups

which in turn are only variations within the species. The two groups based on the margin of the scutellum being either black or pollinose has been discussed.

The degree of pollinosity on the first abdominal segment breaks the males of *setiger* into two groups and the females into three. According to Cole's description of *Metapogon setigerum* (now *C. setiger*) (Proc. Calif. Acad. 4th ser. 9(7):235–236. 1919) the pruinosity of the first abdominal segment is confined to the lateral margins. There are many male specimens at hand which agree, but many others have the first segment entirely pollinose except for a posterior black, median crescent of variable widths. This posterior crescent is occasionally found on other segments of the abdomen.

The pollinosity of the first abdominal segment of 89 per cent of 198 females was generally confined to the lateral margins; 10 per cent had the pollinosity narrowly interrupted; 1 per cent were with the first abdominal segment totally pollinose.

The bristles on the lateral margin of the first abdominal segment were variable in color on 198 specimens. Five per cent of the female specimens of *setiger* had only black bristles; 80 per cent had light tan or sordid white bristles; 15 per cent had both black and pale bristles. The number of bristles ranged from two to six, and the number varied from one side to the other of the same specimen. There was a similar variability of number and color in the hypopleural bristles.

VENTER—The venter of the males of some specimens of *setiger* was totally pollinose, on other specimens there were posterior and anterior pollinose bands on each segment, while in a third group these bands were connected by a median cross mark of pollen.

HALTERES—The color of the knobs of the halteres of *setiger* is highly variable. On many specimens they are some shade of yellow, but on others the knobs are light brown, or some shade of pink. Most of the latter were collected at higher elevations in company with *sculleni*.

VARIATIONS OF COLEOMYIA SCULLENI

Two hundred forty specimens of *Coleomyia sculleni* W. & M. have been collected by the writer and his wife from Cloud Cap Road and Still Creek Forest Camp, Mt. Hood, Santiam Pass, Paulina Lake, and Crater Lake, Oregon, during July and August. The variability in this species is similar to that in *setiger*.

SCUTELLUM—Both sexes of *sculleni* could be divided into two

distinct groups by the color of the margin of the scutellum. Seventy-eight per cent of 85 specimens from Crater Lake, 34 per cent of 70 specimens from Santiam Pass, and 96 per cent of 85 specimens from Mt. Hood had the margin pollinose. The margin was black in the rest.

The number of bristles on the margin of the scutellum varied from two to five. Forty per cent of the 85 specimens from Mt. Hood had three or more bristles, while 25 per cent of the 155 specimens from other localities had more than two bristles. The length of the bristles varied as in *setiger*.

ABDOMEN—*Coleomyia sculleni* shows a variability in the pollinose pattern on the abdominal segments which is similar to that in the three groups of *setiger*. In *sculleni* the males can be divided into two distinct groups:

Group I—The posterior, uninterrupted, silvery pollinose band of adominal segments three to six wider on the dorsum than on the lateral margin, leaving a black, anterior angle. The holotype specimen falls in this group.

Group II—The posterior, silvery pollinose bands of segments three to five similar to Group I except segment five has a smaller black, anterior angle. Segment six is completely pollinose.

There are other male specimens whose pollinose pattern represents a transition between Groups I and II. No other characters were found which would separate the specimens into the above two groups. Group II is represented by 50 males collected in an hour in an area of 100 square feet on Mt. Hood at Timberline Lodge. The abdominal pollinose pattern of two male specimens in the Timberline series resembled the typical *sculleni* of Group I.

The holotype male of *sculleni* bears posterior abdominal pollinose bands with a black triangular area on the posterior margin of the segments so that pollinose chevrons are formed. On most males of *sculleni* the bands are only slightly denuded posteriorly so as to form a very thin crescent. Of all the males collected, only two closely resembled the type specimen in possessing chevron-shaped pollinose bands. These specimens, which were collected at Crater Lake, August 30, 1948 by Dorothy Martin and by Chas. H. Martin, are designated metatypes. Also two females, Crater Lake, August 30, 1949, by the same collectors, are designated metatypes. Eighty-five other specimens with the same data as the metatypes are designated as topotypes. The number of lateral bristles on the first abdominal segment of *sculleni* varied from two

to six. The color ranged from black to pale brown to white. Frequently both black and pale bristles were on the same specimen.

STABLE CHARACTERS—Two characters of *sculleni* were more stable than others. All specimens had the knob of the halteres claret red. Usually there was a white, stout bristle on the pronotum opposite the first spiracle on the mesonotum. This bristle was black on a few specimens including the allotype.

SCUTELLAR BRISTLES IN OTHER SPECIES—The number of bristles on the margin of the scutellum has been discussed for *setiger* and *sculleni*. A series of 42 *Coleomyia alticola* James from Taos-Colfax County Line, Highway 64, New Mexico, July 30, 1948, Martins, Coll., had only two bristles on the scutellum of all specimens. In *C. rainieri* W. & M. the number varied from two to six. The maximum number of scutellar bristles on *C. hinei* W. & M. was two, while 14 per cent of 62 specimens had only one bristle. Apparently there is a tendency toward reduction of scutellar bristles in *hinei*. *C. crumborum* Martin shows the opposite tendency; all of the 48 specimens had three to six bristles; none had two.

TWO NEW HIPPOMELAS

(Coleoptera–Buprestidae)

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In the California Academy of Sciences collection there are two *Hippomelas* from islands in the Gulf of California, currently considered as "varieties" of *H. planicosta* (LeConte), which appear to require separation. The two new forms are apparently closely related to each other, but they differ appreciably from *H. planicosta*.

Hippomelas insularis Helfer, new species

Male: elongate oval, shining black with some punctures bluish or brassy, and with a yellowish efflorescence over the surface, more brassy beneath. *Head* brassy, becoming blue at occiput. Front broad, coarsely, closely setopunctate and with small irregular impunctate areas, the setae silvery and moderately long; antennae 11 segmented, reaching to hind angles of pronotum, inserted in rather small round cavities under sharp, prominent suprantennal ridges which are set at about 20° angles and which are almost connected across the front by a transverse carina which is separated from